What is claimed is:

1   1.   A method for fabricating a titanium nitride (TiN)
2 sensing membrane on an extended gate field effect transistor
3 (EGFET), comprising the steps of:
4   depositing a layer of aluminum on a gate terminal of
5   the EGFET using thermal evaporation, wherein the
6   layer of aluminum extends from the gate terminal
7   to a sensitive window of the EGFET; and
8   forming the TiN sensing membrane on an exposed part of
9   the layer of aluminum in the sensitive window as
10   an ion sensitive sensor (pH sensor) using a radio
11   frequency (RF) sputtering process during which
12   TiN is used as a sputtering target and a mixture
13   of argon and nitrogen in the ratio of 9:1 is used
14   as a reactant.

1   2.   The method as claimed in claim 1, wherein a
2 substrate temperature of 150°C, a deposition pressure of 5
3 milli-torrs, a sputtering duration time of 1 hour, and an RF
4 power of 90 watts are the preferred operating conditions for
5 forming the TiN sensing membrane.

1   3.   The method as claimed in claim 1, wherein the TiN
2 sensing membrane has a thickness of about 1800 to 2900Å.

1   4.   The method as claimed in claim 1, wherein a gate
2 terminal of the pH sensor is referred to as a reference
3 electrode of the pH sensor.

1   5.   The method as claimed in claim 1, wherein the
2 EGFET includes a temperature sensor and a photosensor.

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1   6.   The method as claimed in claim 5 further
2 comprising the steps of:
3   forming an N-type well over a P-type substrate and then
4   a P-type diffusion region within the N-type well
5   using an ion implantation process to form a
6   temperature diode consisting of the P-type
7   diffusion region with respect to the N-type well,
8   such that the temperature diode acts as a
9   temperature sensor to sense a temperature under a
10   forward bias; and
11   forming an N-type diffusion region within the P-type
12   substrate using an ion implantation process to
13   form a photodiode consisting of the N-type
14   diffusion region with respect to the P-type
15   substrate, such that the photodiode acts as a
16   photosensor to sense a photointensity under a
17   reversed bias.

1   7.   The method as claimed in claim 6, wherein the
2 temperature sensor senses the temperature by determining a
3 decreased turn-on voltage to be a higher temperature under
4 forward bias.

1   8.   The method as claimed in claim 6, wherein the
2 photosensor senses the photo intensity using a feature that
3 a current caused by changing charge varies with the degree
4 of the photointensity under the reversed bias.

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